SVKM's
D. J. Sanghvi College of Engineering

Program: B.Tech in Electronics & Telecommunication Engg **Academic Year: 2022** **Duration: 3 hours**
Date: 07.01.2023
Time: 10:30 am to 01:30 pm
Subject: Digital Signal Processing (Semester V) **Marks: 75**

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.
(1) This question paper contains two pages.

(2) All Questions are Compulsory.

(3) All questions carry equal marks.

(4) Answer to each new question is to be started on a fresh page.

(5) Figures in the brackets on the right indicate full marks.

(6) Assume suitable data wherever required, but justify it.

(7) Draw the neat labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1 (a)	Given x(n)={1,2,3,4,4,3,2,1 } and N=8 Find X(k) using DIT FFT algorithms **OR** Given $x(n) = n+1$ $and\, N = 8\, Find\, X(k)\, using\, DIFFFT\, algorithms$	[10] [10]
Q1 (b)	State and prove Parseval's theorem	[05]
Q2 (a)	Convert an analog filter with system function H(s)in to digital IIR filter using impulse invariance method $H(s) = \frac{10}{s^2+7s+10}$ Assume T= 1 sec **OR** For the analog transfer function $H(s) = \frac{3}{(s+2)(s+3)}$ Determine H(z) with sampling period T = 0.1 sec using Bilinear Transformation method	[08] [08]
Q2 (b)	Explain the Design procedure for Chebyshev approximation	[07]
Q3 (a)	Determine the zeros of be following FIR systems and indicate whether the system is minimum phase, maximum phase or mixed phase (i) $H_1(Z) = 6 + Z^{-1} - Z^{-2}$ (ii) $H_2(Z) = 1 - Z^{-1} - 6Z^{-2}$ Comment on the stability of the minimum and maximum phase system (OR)	[07] [4+3] [07]

	Explain the Minimum phase, Maximum Phase, Mixed Phase, all pass, linear phase, stable systems with proper diagrams	
Q3 (b)	Design a Linear phase FIR Digital filter for a given specification for hamming window of length M=7 $Hd(\omega) = e^{-j3\omega}$ *for* $\omega \le \pi/6$ $= 0$ *otherwise* **OR** Design the seventh order low pass linear phase FIR filter with cut off frequency 1 rad/ sec using hanning window	[08] [08]
Q4 (a)	Explain the Quantization, truncation and rounding in detail **OR** Explain the architecture of TMS320CX fixed point DSP processors.	[10] [10]
Q4 (b)	Explain the Special Instructions used in DSP Processors	[05]
Q5 (a)	**Solve any two.** i. State and prove the Twiddle factor (phase factor) property ii. Obtain the transfer function of Butterworth filter when N=1 iii. Explain the application of DSP for ECG signals analysis iv. Write a short note on Computer architecture for signal processing	 [05] [05] [05] [05]
Q5 (b)	Explain the Application of DSP for Dual Tone Multi Frequency signal detection	[05]